materials, always use a notebook." The whole chapter on preliminary reading could be condensed into three pages, and page after page could be reduced one-half. There is a legal tone throughout. The examples are almost all of them taken from the speeches of lawyers, often in technical points which the average student finds difficult to apply.

Yet with all its faults the book is perhaps the most practical of the compilations that have thus far treated the subject. It seeks constantly for definite results, and in the hands of the skilful teacher it may lead the student to real proficiency in the art with which it deals.

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The Elements of Geometry. By WALTER N. BUSH AND JOHN B. CLARKE. New York: Silver, Burdett & Co., 1905. Pp. xii+355.

It is refreshing to pick up a geometry cast in a newer mold. The authors of *The Elements of Geometry*, Bush and Clarke, have discarded the usual division into books and have arranged the theorems in twenty-six groups. Some idea of the method of arrangement may be gleaned from the titles of some of the groups: the Group of Adjacent and Vertical Angles; the Parallel Group; the $2n-4$ Right Angle Group; the Group of Isosceles and Scalene Triangles; the Group of Congruent Triangles; Group of Similar Figures.

The propositions are placed on the page in this fashion:

IV. 4. *In any triangle the greater triangle lies opposite the greater side.*

An attempt has been made to make the statement of theorems as short as possible. This has not always resulted well, as in the statement: "XXVI—8. The area of a spherical triangle equals its spherical excess." The author is using the right angle as unit. This expresses the area of a spherical triangle in right angles. Many theorems are broken up into several simpler ones, which certainly adds much to the ease with which a secondary pupil reads the book. Another excellent feature is the tabulation of the theorems at the close of each group, a great aid to reference and review. On p. 99 we find a concise statement in symbols of the important theorems on the properties of the angles and lines of a triangle. Scattered through the book are a large number of very excellent theorems and exercises to be wrought out by the pupil.

Symbols are extensively used, giving an open look to the page and a clear-cut and concise look to the proof. Most of the diagrams stand demurely on the page in the orthodox style for a textbook. In solid geometry there has been a pleasing and really valuable intermingling of photographs, plane drawings, and shaded drawings combining the advantages of all and free from the evils due to the exclusive use of any one style.

Among the terms used may be noted: "congruent," "join," "mid-join," "mid-perpendicular,' "4-side," "isoangular" (a triangle having two equal angles). A purist in language might object to this last mongrel word, "isoangular," made from Greek and Latin stems. The name "isosceles"—equal legs—is descriptive; but equal-angles is not so fitting. Many of the definitions are an improvement upon those usually given, but others are defective, a few of which may be noted. A line is defined and then the definition is explained. Similar figures are defined as "figures of the same shape," which merely gives another name for the idea, but does not define the

idea; the usual false definition of a prism is given: "A prism is a polyhedron, two of whose faces (called bases) are parallel polygons and whose faces are parallelograms; whereas we know that all figures fulfilling these conditions are not prisms. We also find that unfortunate definition of a limit in which it is said that the variable cannot reach its limit. On p. 2 we find that "a polygon is a portion of a plane bounded, etc.," and that "a quadrilateral is a four-sided polygon;" and on p. 53 "a quadrilateral or 4-side is a figure formed by the intersection of four lines no three of which pass through the same point."

The authors make no distinction between the axioms of geometry and the general axioms, and continue the unfortunate practice of defining a "postulate as a construction admitted to be possible." Nor have they succeeded in steering clear of those common pitfalls, undefined terms, concealed assumptions, unfounded inferences from figures that happen to be drawn. The common practice of founding a theory of limits on that silly postulate: "If while approaching their respective limits, two variables are equal, the limits are equal" leads them to try to prove that the "circumference of a circle [meaning the length of the circumference] is the common limit to which the perimeters of similar inscribed and circumscribed regular polygons approach, etc.," . . . . and that the area is the common limit, etc., the treatment is neat and differs from that usually given, but is by no means a proof. This is a case in point where an undefined term, length of circumference, area of circle, is used.

The fact that a great circle arc is the shortest line to be drawn on a spherical surface between two points is a fact of some interest; and, as a pure assumption, should, I think, have a place in elementary geometry. But the authors' attempt to prove it only mars the book and misleads the pupil, if he be dull enough to ascribe any weight to it. The treatment of the "Group on geometry of the sphere surface" is of interest, especially so in connection with the correspondence of theorems and proofs on the plane and the sphere. As a whole the book is well worth examination, and certainly in itself justifies its publication.

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Advanced Algebra. By ARTHUR SCHULTZE. New York: The Macmillan Co., 1906.

This book is a step forward in the right direction. In some respects the author has broken with the traditional, notably in his development of the subject from the point of view of the equation. This tends to infuse life into the subject and to do away with much of the purely mechanical work-by-rule. Instead of seeming a meaningless puzzle to the student, algebra thus begins to show a definite purpose and to have a practical application. The practical side is still more emphasized by the numerous applications from geometry and physics and from commercial life which the author has introduced. The emphasis laid on the problems will develop in the student the much-needed power of analysis. An early introduction of the factor theorem in connection with the chapter on factoring would have enabled the author to carry his plan to a logical and pedagogical conclusion, by the introduction, in this connection, of the solution of equations of the second and higher degrees. Thus the student would have become acquainted with one of the most practical applications of factoring which would be of use to him in succeeding chapters. This would keep him in touch with the method of factoring, whereas most students drop the subject as soon as fin-